April 9, 2004

To: Dr. Angela Nugent, Designated Federal Officer
Environmental Protection Agency - Science Advisory Board
Committee on Valuing the Protection of Ecological Systems and Services
Workshop on Different Approaches and Methods for Valuing the Protection of Ecological Systems and Services

Purpose: Present a project summary to the committee as a formal written public comment for their consideration and to enter it into the public record; provide the committee information about published materials that may be available now or in the future.

Introduction

The Pacific Northwest has been the focus of national attention in relation to the Endangered Species Act (ESA) with the decline in native salmonid species and spotted owl populations. Many urban areas in this region face degraded environmental conditions that have serious economic repercussions. Over 80% of the state of Oregon population lives in the Willamette River Basin. The Portland metropolitan area straddles the Willamette River, where ESA, Clean Water Act (CWA), and Superfund clean up issues collide. The Portland Harbor was added to the National Priorities List of Superfund sites in 2000. The Willamette River is on the 303(d) list of the Clean Water Act for toxics, temperature, bacteria, and more. Threatened salmonids travel this river in various life stages.

The City of Portland is investing increasingly greater funds to restore or replicate these ecosystem services necessary to maintain a baseline level of Portland's environmental health (combined sewer overflow correction, health cost reduction, endangered species protection, carbon sequestration, etc.) Jim Middaugh, Director of the Endangered Species Act Program for the city, is looking for tools to help recognize the value of restoration and protection of ecosystem services.

The consultant team of David Evans and Associates, Inc. and ECONorthwest was contracted to develop and test an analysis tool for valuing ecosystem services. The potential utility of the analysis tool, called a Comparative Valuation of Ecosystem Services (CVES), for evaluating City projects and policies was tested and refined using the Lents Flood Abatement Project as a case study. The Lents Flood Abatement Project objective is to store waters generated by up to 10-year flood events (nuisance floods) and expand options for community redevelopment. The project would include the creation of a 140-acre riparian area adjacent to Johnson Creek, a tributary to the Willamette River.

Five quantifiable ecosystem services generated by this project were evaluated. They include: flood abatement; biodiversity maintenance (avian habitat and salmonid habitat); air quality improvement (removal of ozone, sul-

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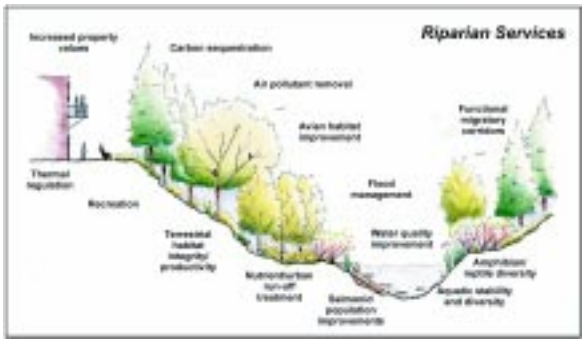
fur dioxide, carbon monoxide, carbon, and particulate matter); water quality improvement; and cultural services including the creation of recreational opportunities and the increase of property values.

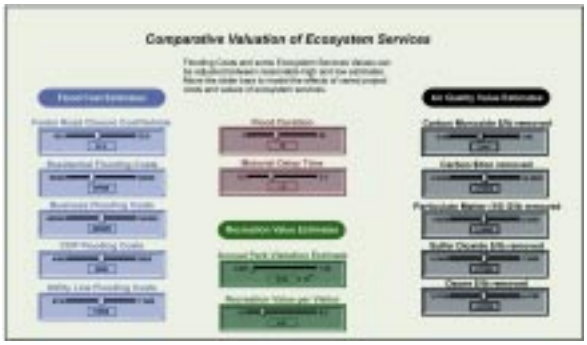


Methods

The CVES analysis estimates the return on investment in the protection and/or restoration of ecosystem services using a systems dynamics modeling software called STELLA. The STELLA software and associated systems thinking framework enables the mapping of key physical, biological and social processes, and to check these representations for logic and function through model simulations. The model primarily consists of stocks and flows representing the things or states of being that exist at a point in time and the actions or activities that occur over-

time. The relationships between stocks and flows are represented in terms of mathematical equations (e.g. exponential increase, random probability of occurrence, etc.).

The stocks and flows used in the CVES analysis are based on the causal loop diagram created in an earlier step that helped to define the types of relationships occurring in the system. A systems dynamics model is generated that integrates the quantitative information obtained from data compiled for the biophysical parameters of the system and the economic values estimated for the ecosystem services. Assumptions and levels of uncertainty are described for each stock and flow.



In order to compare relative costs and benefits of different actions or level of action, stocks and flows can be constructed to represent different elements the effects of alternatives. In addition, the slider tool in the STELLA model allows users to adjust constant values within a range. Scenarios can be developed based on high and low estimates for the amount of change in biophysical characteristics or the upper and lower bounds of the range in estimated monetary values of ecosystem services. Scenarios can then be modeled and results compared, providing for a sensitivity analysis to be conducted. Results can be presented as gross benefits or net benefits over time.

Findings

Economic models and published literature and studies were used to assign economic values to the increased services over time. Economic value in this case is the monetary worth of services such as water purification, air purification, and flood control as determined by methods such as avoided cost or replacement value, assessment of amount people are willing to pay for a service, and analysis of property values and travel expenditures. Using a natural, or ecosystems, approach for the Lent's Flood Abatement Project was estimated to provide more than $30,000,000 (in 2002 dollars) in economic value to the public over a 100-year timeframe. By comparison, a hypothetical alternative of a buried pipe and pump system to achieve the same flood abatement goal would accrue only $15,000,000 in economic value to the public over the same 100-year timeframe and at a much higher cost than using the ecosystems approach.

Policy Implications

City projects that affect riparian and wetland areas generate a range of biophysical and economic impacts. Deliberations on these projects typically focus on project costs without considering the value of the biophysical and economic benefits of the project. The CVES method helps improve this process by adding biophysical and economic information on ecosystem services not previously included in the City's review of riparian related projects.

Summary/Conclusions

The CVES method incorporates as much existing, local economic and ecological data as are available and supplements with regional and national data as needed. The analysis provides information about the monetary benefits and also describes additional benefits that could not be quantified due to the site-specific nature of the project. The process, however, can be applied to various scales and is adaptable to stakeholder involvement. The primary participants and contact information are listed below if you have any questions. The final report will be released at the beginning of May 2004. A copy of this report will be sent to Dr. Angela Nugent. Additional copies can be made available upon request.

Contacts

City of Portland, Oregon
Jim Middaugh
Director of the Endangered Species Act Program
Jmiddaugh@ci.portland.or.us
503-823-7032

David Evans and Associates, Inc.
Dan Heagerty/Gillian Ockner
Project Manager/Assistant Project Manager
Ddh@deainc.com/Gcf@deainc.com
1-800-721-1916

ECONorthwest
Dr. Ed Whitelaw
Economic Valuation Technical Specialist
whitelaw@eugene.econw.com
541-687-0051